U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Sedum eastwoodiae*

COMMON NAME: Red Mountain stonecrop

LEAD REGION: Region 8

INFORMATION CURRENT AS OF: April 1, 2010

STATUS/ACTION:

___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
___ Non-petitioned
_X_ Petitioned - Date petition received: May 11, 2004
(Center for Biological Diversity *et al*. 2004)
__ 90-day positive - FR date:
__ 12-month warranted but precluded - FR date:
__ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES
a. Is listing still warranted? Yes
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes
c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.
Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (*http://endangered.fws.gov/*) provides information on listing actions taken during the last 12 months.

___ Listing priority change
Former LP: ___
New LP: ___

Date when the species first became a Candidate (as currently defined): _1975_

___ Candidate removal: Former LP: ___

___ A - Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F - Range is no longer a U.S. territory.
___ I - Insufficient information exists on biological vulnerability and threats to support listing.
___ M - Taxon mistakenly included in past notice of review.
___ N - Taxon may not meet the Act's definition of "species."
___ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY:
Flowering plants, Crassulaceae (Stonecrop Family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Mendocino County, California

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Mendocino County, California

LAND OWNERSHIP

Twenty five of the 27 known occupied polygons mapped or documented on Red Mountain (Jennings 2003, pp. 1-8) were located on Bureau of Land Management (BLM) lands. In October, 2006, the BLM portion of the distribution was designated the Red Mountain Unit of the South Fork Eel River Wilderness Area (hereafter referred to as the Red Mountain Wilderness), managed by BLM. The remaining two polygons are located on lands owned by Coombs Tree Farm of Garberville, California, and Silver Peak Mining Company. Additional undocumented occurrences may exist on private land. Based on presence of suitable soils in the area, between 5 and 20 percent of the distribution is expected to occur on private property, with the remainder on BLM property.

LEAD REGION CONTACT: Andy DeVolder (Region 8) (916) 414-6464, Andy_DeVolder@fws.gov)

LEAD FIELD OFFICE CONTACT: Arcata Fish and Wildlife Office, David Imper (707) 822-7201; David_Imper@fws.gov

BIOLOGICAL INFORMATION

Due to the extremely remote location of the Red Mountain Wilderness, access is difficult, and the BLM maintains the most up-to-date information regarding this species and its habitat. We have reviewed our files, the California Natural Diversity Data Base (California Department of Fish and Game [CDFG] 2010), and contacted the Arcata Office of BLM as part of updating this

candidate form.

Species Description

Sedum eastwoodiae is a perennial succulent that stands 7-19 centimeters (cm) (2.7-7.1 inches [in]) tall. Leaves form rosettes that are 1-6 cm (0.8-2.7 in) in diameter, rosette leaves are 10-29 millimeters (mm) (0.8-1.14 in), widest ± 6 mm (0.34 in) below the tip, 2-5 mm (0.07 – 0.2 in) thick, rounded to barely notched. Leaves on the stem stalk are 4-17 mm (0.2 – 0.7 in), base truncate to rounded. Blooms are composed of 10-26 pink to dark red flowers; anthers light red to purple.

Taxonomy

Nathaniel Britton described this taxon as *Gormania eastwoodiae* in 1903, based on specimens from Red Mountain, Mendocino County, California, collected by Alice Eastwood (Britton 1903, p. 31). Nomenclatural changes followed, and in 1975 the taxon was reduced to the sub-specific level by Robert Clausen, renaming it *Sedum laxum* ssp. *eastwoodiae* (Clausen 1975, pp. 399-403). Melinda Denton returned the species to *Sedum eastwoodiae* (Denton 1993, pp. 531-532).

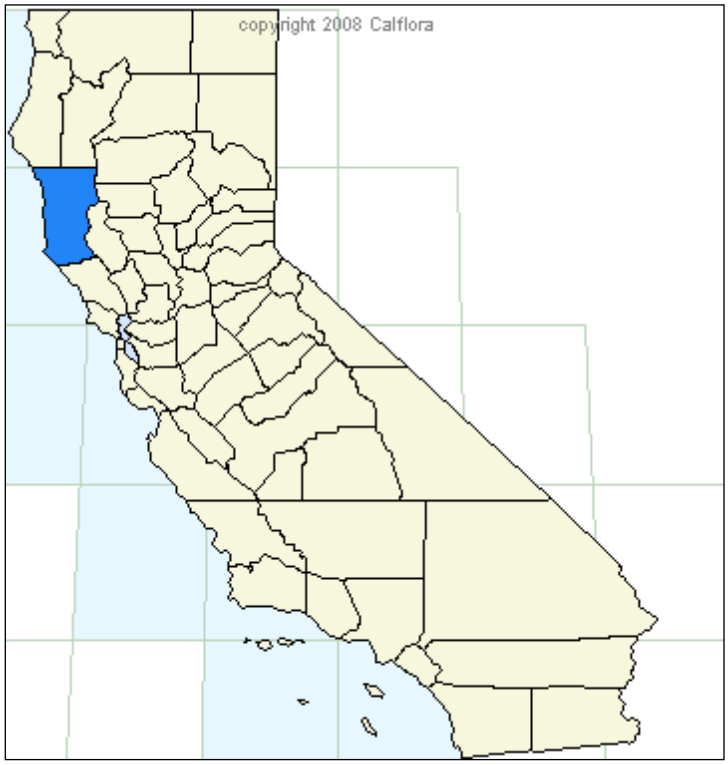
Habitat/Life History

This species occupies relatively barren, rocky openings and cliffs, generally on west-faced slopes, in lower montane coniferous forest habitats. Soils are derived from serpentine rock.

Historical and Current Range/Distribution

This species appears to have always been rare, and is currently known to occupy an estimated 22 hectares (ha) (54 acres [ac]) of habitat scattered over about 10.4 square kilometers (4 square miles) located at Red Mountain, Mendocino County, California. This species is found between

580 and 1,250 meters (1,900 to 4,100 feet) in elevation (Jennings 2003, p. 2).



Distribution of *Sedum eastwoodiae* in California by county;
Used with permission of Calfora (2008)

Population Estimates/Status

Jennings (2003, p. 8) mapped the majority of *Sedum eastwoodiae* occurring within the Red Mountain Wilderness. Twenty-five occupied polygons encompassing an estimated 22 ha (54 ac) were mapped on BLM lands. The polygons ranged in size from less than 0.1 ha (0.25 ac) to nearly 4 ha (10 ac). At least two occupied polygons, not included in the survey, occur on private lands nearby. Those polygons probably encompass less than 0.4 ha (1 ac) (David Imper, USFWS Arcata Field Office, 2003). Jennings (2003, p. 2) provided a conservative estimate of 5,300 plants as the minimum total population of *Sedum eastwoodiae* observed in his survey effort. Based on a more accurate estimate of number of plants within three polygons and extrapolating to the entire occupied habitat area, Jenning's data suggest the total population could be on the order of 29,000 plants. The above estimates of occupied habitat and population do not include potential habitat located on the steep slope above Cedar Creek and on private lands in the vicinity. The un-surveyed areas, included within the estimate of occupied range described above, are not expected to contribute more than 10-20 percent to the estimate of total occupied habitat and population.

Dr. Michael Baad monitored eight 5 square-meter (16 square feet) permanent plots within 4 general areas of Red Mountain annually from 1987 to 1998 and 2002 (Baad 2002, pp. 2-42). Individuals were counted and mapped in each plot and classified as seedlings, non-reproductive or reproductive. *Sedum eastwoodiae* canopy coverage in the plots ranged between 414 and 671 square centimeters/plot (64 - 104 square inches/plot) between 1988 and 2002, with no consistent

trend exhibited over that period (Baad 1998, p. 8). *Sedum eastwoodiae* densities from year-to-year were more stable than its canopy coverage, apparently due to strong survivorship, but seedling success and inflorescence production varied even more canopy coverage over the 15 year study (Baad 2002, p. 6). One of the plots was lost due to a rockslide prior to the 2002 sampling period (Baad 2002, p. 6).

Most of the historic occurrences mapped by Baad on BLM land in 1986 (Baad 1987, p. 4) were relocated by Jennings (2003, p. 8). However, the low resolution of the 1986 mapping effort and the limited scope of the 2003 mapping effort prevented our making any conclusions regarding population trends

THREATS:

A. <u>The present or threatened destruction, modification, or curtailment of its habitat or range</u>.

The entire known distribution of *Sedum eastwoodiae* at Red Mountain continues to be held under unpatented lode and/or placer mining claims, and/or is privately owned by past or current mining interests (BLM 2009). No mining is currently conducted on BLM or private lands, and no validity exams have been conducted on any of the mining claims (see below). One of the private claim holders that has a known *S. eastwoodiae* occurrence recently passed away, and the heir to the estate has indicated, at least for the time being, she has no interest in pursuing mining (Wheeler, pers. comm. 2009).

Under the Northern California Coastal Wild Heritage Wilderness Act of 2006 (H.R. 233 [109th]) 6,500 acres on and around Red Mountain was designated wilderness, added to the existing South Fork Eel Wilderness Area. That legislation specifically retained valid land rights, such as mining claims, in existence on the date of enactment. However, the area was withdrawn from all new forms of 1) entry, appropriation, or disposal under the public land laws; 2) location, entry and patent under mining laws, and 3) disposition under all laws pertaining to mineral and geothermal leasing or mining of materials.

For the existing claims, before BLM may approve a mining plan of operations, the BLM minerals staff must conduct a validity examination to determine if the claim is valid (J. Willoughby, BLM, pers. comm. 2007). The validity exam involves a determination of whether a mining operation on the claim was economically viable at the time the claim was filed. Because there are different claimholders on Red Mountain that likely filed claims at different times, separate validity exams would need to be performed, raising the cost of conducting the examination. Due to the high cost of the validity examinations, BLM typically only does them when a plan of operations is filed by a claimholder (Willoughby, pers. comm. 2007). The BLM has 60 days to determine if sufficient information was provided to conduct a validity

examination, and then 2 years to complete the examination. If the validity examination fails, the claim is cancelled. If the claim is determined to be valid, the claimant may file patent to gain ownership to the land, although for short-lived mining operations a patent is often not filed. The BLM does not have the right to deny such a patent. There appears to be some legal uncertainty as to whether a patent within designated wilderness area covers both the land and mineral rights, or just mineral rights. The majority of recently conducted validity examinations in California have failed (Willoughby, pers. comm. 2007).

Any mining operation on Red Mountain would most likely be an open-face bench type that would involve removal and processing of the mineral-bearing ore containing nickel, chromium, and cobalt (U.S. Fish and Wildlife Service [Service] 1984, p. 14). All vegetation and habitat for *Sedum eastwoodiae* could potentially be removed in the affected area. Although the operations plan would require restoration of the affected areas, plant species composition would undoubtedly be altered. There is no evidence in the literature indicating *S. eastwoodiae* is able to recolonize disturbed soils.

With regard to the potential for Red Mountain to be mined, a Bureau of Mines Preliminary Feasibility Study conducted at Red Mountain in 1978 concluded those deposits met the minimum tonnage grade test at the time; i.e., 35 million short tons of material containing an average 0.8 percent nickel (Geer, pers. comm.1995). However, commercial mining at Red Mountain was not considered economically feasible at the time due to the low relatively low grade of the resource (low metal concentrations) and the high cost of mining it (Geer, pers. comm. 1995). The likelihood and extent of future mining will depend on the future economic feasibility and demand for minerals found in the area.

In addition to mining, other factors that could potentially destroy, modify, or curtail its habitat include road construction, widening and maintenance, off-road vehicle (ORV) use, logging and vegetation encroachment. The majority of past soils disturbance at Red Mountain in general has been caused by mining exploration and road construction, both for mining access and fire control (Imper and Wheeler, unpubl. data 2009). The current OHV use at Red Mountain is largely related to illegal marijuana gardens. There is a proposal to enhance recreational use of the Red Mountain Wilderness with construction of a foot and/or horse trail, which would encourage public use and likely discourage marijuana growing and illegal vehicle use (Wheeler, pers. comm. 2009). *Sedum eastwoodiae* also can occur in semi-forested habitat,where it potentially could be subject to impact by logging operations, such as disturbance from cable logging (Clare Golec, CDFG, Ft. Bragg Office 2005). However, due to the tendency of this species to occur on rock outcrops and rocky slopes, none of the above factors, other than mining, is expected to impact a significant portion of its distribution.

Habitat modification as a result of natural vegetation changes in absence of fire may be a primary threat to this species, at least in the long term. Fire has been shown to be an important factor affecting vegetation patterns and maintenance of many open habitats, similar to *Sedum eastwoodiae* habitat, across the Klamath Bioregion, lying immediately north and east of Red Mountain, and the North Coast Bioregion, which includes Red Mountain (Skinner *et al.* 2006, pp. 175-178; Skinner *et al*. 2009, pp. 76-98). Pre-European settlement fire-return intervals for

mixed conifer stands, while variable, in some cases ranged as little as 6-8years (Skinner *et al*. 2009, pp. 83-84). A dramatic decline in fire frequency since then has allowed conifer encroachment or establishment of dense shrub stands in many areas of the region.

Only 2 fires appear to have influenced the Red Mountain area over at least the past 90 years. The Red Mountain Lightning fire of June, 2008, burned approximately 3,000 acres within the Red Mountain Wilderness (BLM 2008). The fire burned some 1,000 acres at the top of Red Mountain, with reportedly 80 percent mortality of brush and 10 percent tree mortality (J. Wheeler, BLM, pers. comm. 2008). The actual burn footprint was highly irregular, and the majority of the burned habitat appeared to have experienced a relatively low intensity ground fire, with little crowning (Imper and Wheeler, unpubl. data 2009). Some 25 percent of the polygons occupied by *Sedum eastwoodiae* mapped by Jennings (2003, p. 8) occur within the boundary of 2008 fire, but the extent that occupied habitat was directly affected by the fire is unknown.

Prior to the 2008 fire, the only fire included on the Fire and Resource Map Project's (FRAP) online historical fire database (California Department of Forestry and Fire Protection 2009) for the immediate area of Red Mountain since the 1920's, was the 1952 Lynch Fire. Evidence suggests the Lynch Fire may have stimulated germination and growth of *Pinus attenuata* in some areas within the distribution of *Sedum eastwoodiae* on the mountain (Service 2010, p. 16).

Baad (2002, pp. 6-7) recognized the threat from vegetation encroachment to at least 3 rare plants known from Red Mountain, including *Sedum eastwoodiae, Eriogonum kelloggii* (Red Mountain buckwheat) and *Arabis macdonaldiana* (McDonald's rockcress). He attributed suppressed reproductive output in *Eriogonum kelloggii* and *Arabis macdonaldiana* at one site to conifer invasion following fire 40 years ago. Although Baad's monitoring plot data that included *Sedum eastwoodiae* have not demonstrated an impact from encroaching vegetation, his study was not designed to provide that kind of information. Clearly, the rate at which habitat becomes unsuitable in absence of fire varies. In absence of fire, Baad concluded that *Sedum eastwoodiae* located on rocky ridge tops and with little woody vegetation appeared relatively stable, but populations situated on deeper soils in more sheltered sites are more vulnerable to shading by competing vegetation (Baad 2002, pp. 6-7). The manner and degree to which the 2008 Red Mountain Fire affected *Sedum eastwoodiae*, either positively, by setting back natural succession within its habitat, or negatively, by killing the plant, is not known.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

No threats are known at this time.

C. Disease or predation.

No threat of disease or predation is known at this time. Unidentified rodent species have been known to sever flowering stems before plants set seed (Ken Fuller, USFWS, Sacramento Office, 1994).

D. The inadequacy of existing regulatory mechanisms.

Sedum eastwoodiae receives limited protection under existing State laws. The species is not listed by the State of California, but it is included on List 1B (rare and endangered throughout its range) maintained by the California Native Plant Society. As a list 1B species, projects located on private lands and subject to review under the California Environmental Quality Act must disclose potential for impacts on the species. The species is listed as sensitive by the BLM, which provides limited protection for that portion of the distribution located on BLM lands.

E. Other natural or manmade factors affecting its continued existence.

Other natural or manmade threats to *Sedum eastwoodiae* are related to its small distribution and overall population, and the potential impacts of climate change. Small populations are more prone to impacts from random environmental events, and from genetic impoverishment as a result of habitat fragmentation, genetic isolation and declining effective population size (Saunders *et al.* 1991, pp. 18-32; Meffe and Carroll 1997, pp. 269-304).

There is no specific information available, both on the likely affects of climate change specific to the Red Mountain region, and whether the ecological characteristics of occupied, or nearby suitable habitat for *Sedum eastwoodiae* there may buffer the affects of climate change. However, if climate change in this portion of California results in a warming trend, casual observation has suggested a majority of the distribution of *Sedum eastwoodiae* occurs in upland, often exposed, xeric habitats that are expected to offer less refuge under drying or warming conditions.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED:

Designation of 6,173 acres of BLM property at Red Mountain as a wilderness study area (WSA) in 1979, 6,895 acres as an ACEC/Research Natural Area (RNA) in 1984, and the recent designation as wilderness has to some extent focused management concern and direction toward conservation of the unique botanical and soils values, old growth forest, raptor habitat and anadromous fisheries (BLM 1995, pp. 3-6 to 3-9). Annual visits are generally conducted by BLM staff to ensure that no new road construction occurs (Wheeler, pers. comm. 2005). Most, or all, of the occupied or suitable habitat for *Sedum eastwoodiae* in the vicinity of the Red Mountain Wilderness was recommended for acquisition (willing landowners) in the Resource Management Plan (RMP) for the area (BLM 1995, pp. 2-32 to 2-37). The RMP also excludes livestock grazing and off-road vehicle use from the area.

Conservation measures implemented in 2009 for *Sedum eastwoodiae* included only a visual inspection and photo-documentation of a portion of its habitat. Previous conservation measures included initiation of the long term life history and population monitoring in 1987 (Baad 2002, pp. 2-8); field mapping of occupied habitat on public lands in 2003 (Jennings 2003, pp. 1-8); and general ongoing public outreach activities such as public field trips and academic visitation. BLM staff applied for grant funding to conduct an ecological assessment (see item 4 under "Recommended Conservation measures" below). That effort was unsuccessful, but both Service and BLM staff will continue to seek funding to implement a complete population inventory, and

ecological assessment of its habitat.

SUMMARY OF THREATS (including reasons for addition or removal from candidacy, if appropriate)

Primary threats to this species include destruction of its habitat as a result of surface mining, and modification of its habitat by encroaching vegetation as a result of fire exclusion. We find that *Sedum eastwoodiae* is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is a threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES:

1) Habitat occupied by *Sedum eastwoodiae* should be withdrawn from all minerals entry.

2) Subject to landowner authorization, the extent of *Sedum eastwoodiae* occurrence on adjacent private property should be documented.

3) Collect field data necessary to develop a baseline population estimate for the species throughout its range.

4) Conduct a field investigation to assess the fire history within *Sedum eastwoodiae* habitat and the relative impacts from the 2008 Red Mountain fire, and the degree which shrub and tree encroachment may be impacting the population. If warranted, begin agency coordination and fieldwork in preparation for experimental reintroduction of fire into *Sedum eastwoodiae* habitat.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	**5***
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8

	Non-imminent	Subspecies/population Monotypic genus Species Subspecies/population	9 10 11 12

Rationale for listing priority number:
Magnitude:
Magnitude of threat to *Sedum eastwoodiae* is rated high. The entire population is either privately held by a mining interest or covered under existing mining claims. *Sedum eastwoodiae* distribution is currently highly fragmented, consisting of approximately 27 relatively small polygons scattered over 10.4 square kilometers (4 square miles). While some colonies or populations may persist if the area is mined, the increased fragmentation and reduction in overall population are potential significant factors affecting population viability. Based on the observed close affinity of this species with native soils, mining may render the affected habitat unsuitable for the species for a significant period.

Imminence:
Imminence of threat is rated non-imminent. Mining activity is not currently affecting *Sedum eastwoodiae* or its habitat. Any proposed mining would be subject to an application process, during which BLM would treat the *Sedum eastwoodiae* as if it were currently proposed for listing, and request conferencing (optional) with the USFWS. The mining claim would also have to proceed through the validation process.

Without periodic fire affecting vegetation structure and composition within its habitat, we expect *Sedum eastwoodiae* will ultimately decline over the majority of its range due to encroachment by shrubs and trees. The rate at which surrounding vegetation structure and composition, in absence of fire, will negatively affect *Sedum eastwoodiae* is unknown. Due to the slow growth rates typically exhibited on serpentine-derived soils, the rate at which habitat becomes unfavorable for *Sedum eastwoodiae* will likely be slow at least in portions of its distribution.

Rationale for Change in Listing Priority Number (insert if appropriate) NA

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted?
Emergency listing is not warranted at this time, based on the following: a lack of current mining activity either on public or privately held lands in the Red Mountain area; and any mining proposed on BLM lands would be subject to conferencing (optional) with the USFWS.

DESCRIPTION OF MONITORING:
The Red Mountain Wilderness is quite remote, surrounded by private landowners, and requires authorization from private parties for access. BLM and/or USFWS personnel generally visit the Red Mountain site on an annual basis to conduct a general reconnaissance and generally assess the status of the species. The USFWS and BLM maintain routine contact, regarding the Red

Mountain site. BLM personnel are routinely in contact with the Coombs Tree Farm Company (private owner), in conjunction with requesting access through their property to the Red Mountain Wilderness.

The only past monitoring of this species was conducted by Dr. Michael Baad, and by Service and BLM staff in 2009 (limited monitoring). Monitoring focused on the plant life history and site-specific trends in population over time. Permanent plots are located at three study sites within the Red Mountain Wilderness. The plots were read annually between 1987 and 1998, and in 2002 and 2006. Individual plants were counted, mapped, measured, and classified as to reproductive class (Baad 2002, pp. 1-8). Service and BLM staff completed the monitoring in 2009 (Imper and Wheeler 2009).

In June and September 2003, *Sedum eastwoodiae* was mapped throughout the majority of the Red Mountain Wilderness to gather baseline data on its distribution (Jennings 2003, pp. 1-8). No accurate distribution maps or current population estimates existed prior to this survey. Limited abundance data were collected from three of the mapped polygons. The mapping effort was conducted to provide the basis for an accurate baseline estimate of population size, which will be conducted in the future, depending on available funds and staffing.

Given the remote nature of *Sedum eastwoodiae* habitat, current low susceptibility to human impacts, and relatively stable nature of the habitat from an ecological standpoint, the current frequency of monitoring is considered adequate to detect any significant threats. Efforts were made by BLM in 2010 to fund an ecological assessment of the fire history within *Sedum eastwoodiae* habitat, the impact of the 2008 Red Mountain fire, and the degree which shrub and tree encroachment may be impacting the population. Those efforts were unsuccessful, but will continue until the assessment is funded.

COORDINATION WITH STATES

Input regarding species status and agency coordination was requested from the State of California, Department of Fish and Game on March 23, 2010 (Attn: Scott Koller, Willitts Office; Tony Labanca, Eureka Office; Mary Ann Showers, Sacramento Office; and Roxanne Bittman, California Natural Diversity Database, Sacramento).

LITERATURE CITED

A. Literature

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B. Personal Communications

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: _____
Regional Director, Fish and Wildlife Service Date 6.7.2010

Concur: _____
ACTING
Director, Fish and Wildlife Service Date: October 22, 2010

Do not concur: _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: April 2010
Conducted by: David Imper

FY 2010, R8 CNOR: Red Mountain stonecrop